

## PROBLEM SET 01

*Assigned: January 19, 2024**Due: February 02, 2024*

Always provide explanations and show as much work as possible.

Solutions to odd-numbered exercises are available at [https://www.algorist.com/algowiki/index.php/Solution\\_Wiki,\\_The\\_Algorithm\\_Design\\_Manual,\\_3rd\\_Edition](https://www.algorist.com/algowiki/index.php/Solution_Wiki,_The_Algorithm_Design_Manual,_3rd_Edition).

- If you are stuck on an even problem, try to find a similar odd-numbered exercise.
- If an odd-numbered problem is assigned, you are expected to (1) first attempt the solution on your own, (2) write and explain your solution in your own words.
- The solutions are written by the community, meaning that some problems may not have solutions and some solutions may be incorrect! I found at least one incorrect solution the last time I taught the course.

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1. Exercise 1-2 from Skiena.
  2. 1-5.
  3. Your classmate claims that all jelly beans are the same color. They give the following proof:

*Proof.* (By induction.) Base case: when we have a single jelly bean it can only be one color.

Inductive hypothesis: Assume that all sets of  $n$  jelly beans are the same color. Consider a set of  $n + 1$  jelly beans. Choose a subset  $A$  of size  $n$  from this set; these beans must be the same color by our inductive hypothesis.

Now consider the bean you did not pick. Swap this bean with any bean from the set  $A$ . This forms a set  $B$  of  $n$  beans, and so must be the same color by our inductive hypothesis.

Sets  $A$  and  $B$  share  $n - 1$  beans, hence each set must be the same color. In other words, all  $n + 1$  beans are the same color.  $\square$

What is wrong with this proof?

4. 1-8
5. 1-9
6. 1-14
7. 1-22. Interviewers love to ask estimation questions like this. The important part here is your *process*, not the actual answer you get. Make some simplistic assumptions and ballpark it.
8. LeetCode 1-1 (Daily Temperatures). Be prepared to present your solution to the class.
9. 2-2
10. 2-7
11. 2-10
12. 2-17
13. 2-26
14. 2-30
15. 2-41